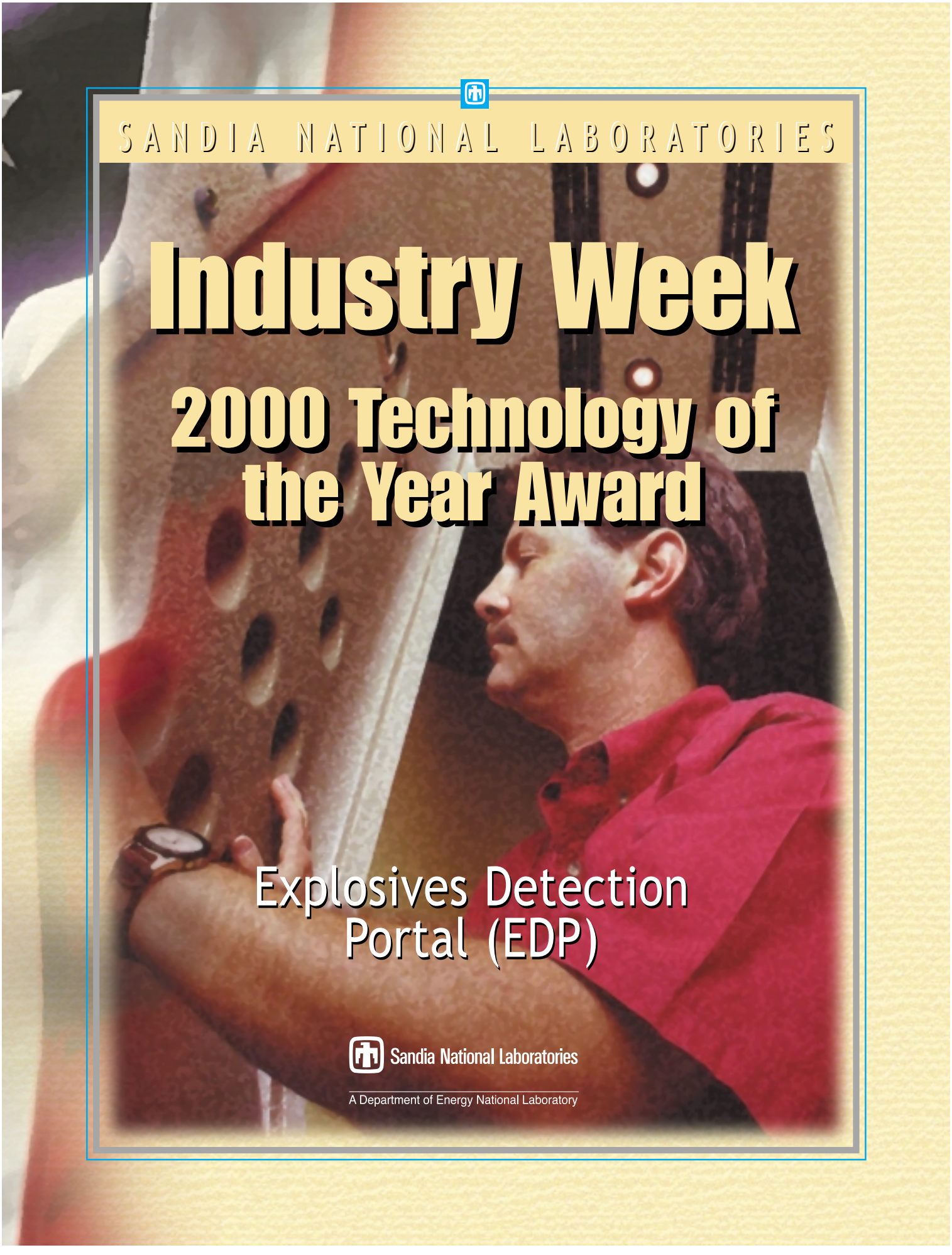

SANDIA NATIONAL LABORATORIES

Industry Week

2000 Technology of the Year Award

Explosives Detection Portal (EDP)

Sandia National Laboratories

A Department of Energy National Laboratory

Explosives Detection Portal (EDP)

Industry Week
2000 Technology of the Year Award

Entry Title:
Explosives Detection Portal (EDP)

CANDIDATE INFORMATION

Technology/Product/Service being entered: Explosives Detection Portal (EDP)

Company Name: Sandia National Laboratories/Contraband Detection Technologies

Address: P.O. Box 5800

Mail Stop: MS 0782

City/State/Zip Code: Albuquerque, NM 87185-0782

Phone: (505) 844-6999 Fax: (505) 844-0011

President & Laboratories Director: Dr. C. Paul Robinson President

Company Director of R&D: Alton Romig, Jr.

Number of employees: 7,600

Major product categories:
1) Science and Technology
2) Nuclear Weapons
3) Non-proliferation & Materials Control
4) Energy & Critical Infrastructure

R&D investment as a percentage of revenue: 15%

Location of headquarters: Albuquerque, NM

Walk-through detection portal that will improve the safety of the traveling public by detecting minute traces of explosives on airline passengers. It was developed by Sandia for the Federal Aviation Administration.

Explosives Detection Portal (EDP)

Submitter: Kevin L. Linker

Title: Principal Member of Technical Staff

Company name (if different from above):

Address: P.O. Box 5800

Mail Stop: MS 0782

City/State/Zip Code: Albuquerque, NM 87185-0782

Phone: (505) 844-6999

Fax: (505) 844-0011

ENTRY FORM

[Please answer each of the following questions in 200 words or less using layman's terms and attach to entry form. Collateral material other than the company's annual report and press announcement will not be considered.]

1) Briefly describe the new product or technology.

Supported by the Federal Aviation Administration, the Explosives Detection Portal (EDP) is a device (using noninvasive sampling techniques to detect common high explosives) that rapidly screens airline passengers who pass through it. Terrorists' use of explosives has prompted the FAA and similar organizations worldwide to develop explosive-detection systems to screen both personnel and baggage. Trace-detection systems (like the EDP) are of particular interest for screening people because they use safe x-rays commonly and appropriately found in baggage screening.

Airports have relied on metal detectors to identify weapons that can be used in highjackings since the 1970s, but the proliferation of plastic explosives and terrorists willing to use them makes metal detectors increasingly ineffective as the sole technology to prevent aviation disasters. A new screening device had to be developed to detect nonmetallic explosive threats. For successful airport deployment, such a detector must be quickly effective in finding a wide array of substances to avoid creating undue passenger delays. The EDP is the only trace explosives-detection system developed with FAA funding that has demonstrated its effectiveness and been licensed for manufacture.

2) How is the new product or technology unique; that is, what can you do with it that you could not do before? What was done before?

Part of the next generation of airport security screening measures, the EDP meets technological challenges posed by the release of minute chemical concentrations into the air. In the past, the science and engineering community considered such concentrations too low to be detectable by any device. The advance that makes the EDP capable of detecting such supposedly impossibly low concentrations is Sandia's breakthrough preconcentrator technology, which resulted in factors significantly exceeding the FAA's explosive-detection goals:

- 1,000 times better sensitivity,
- 200 times smaller size,
- 13 times lower cost, and
- 4 times greater speed.

Combining current x-ray and metal-detection baggage checkpoints with the EDP's trace explosives-detection portal to screen people could greatly enhance security checkpoints—especially by preventing terrorism against airliners.

Boosting the level of security screening previously unavailable, the EDP is the first safe, fast, efficient, acceptable, and affordable trace explosive-detection system demonstrating that it meets FAA specifications and the first licensed for commercial manufacture. A field test supported the EDP's effectiveness, and an airline passenger survey confirmed its acceptability to the public. The EDP is the first and only safe, fast, effective, acceptable, and commercially feasible explosives-detection system available for widespread application in airports.

3) What competitive companies are pursuing similar technologies or solutions? Why does yours stand out from those of your competitors?

Airline industry requirements to detect potential terrorist acts have resulted in a greater need to develop a more reliable, accurate, and effective explosives-detection system than today's metal-detection tools, observation efforts, and other techniques.

Health/safety concerns associated with x-ray and magnetic-resonance explosives detection systems render them unsuitable for use with people. Several technologies can screen baggage for explosives, but are inappropriate for people [i.e., excluded technologies include

transmission x-rays and computed tomography x-rays (increased cancer risks), or cloth swipe IMS (considered invasive because requires touching passenger's cloth)].

The EDP's major advantage is its demonstrated ability to rapidly detect common high explosives with a high sensitivity [parts per quadrillion (ppq)] using an acceptable sampling method. EDP improvements over competing technologies are:

- **Analysis Time**—reduced total analysis time 20% to 12 sec and meets FAA average/minute-passenger-throughput requirements.
- **Noninvasive**—uses safe, comfortable air sampling.
- **Floor Area**—reduced floor area up to 67% for equivalent detection capabilities while meeting FAA specifications.
- **Detectors**—unlimited by any detector technology.
- **Compounds Detected**—can collect and detect common high explosives, and be adapted to detect nonnitrated explosives, narcotics, and other chemical agents.
- **Cost**—40% less costly than portals with equivalent detection capabilities.

Demonstration of a mock chemical-sensing detector (sniffer) on an unfuzed antitank mine.

4) Describe any new or innovative use of design, materials, manufacturing processes, testing, or marketing as it applies to the new product or technology.

Two FAA requirements presented challenges—having a unique portal design meeting airline requirements acceptable to passengers, while efficiently and safely detecting trace explosives.

With the EDP, upon entering the portal, the passenger turns left and stands while being screened for 5 sec—against the FAA's specified 10-sec throughput rate. During screening, a portal ceiling fan releases a 4-mph airflow from head to toe over the person, and the air is collected by ductwork near the person's feet. **This collection (in the absence of doors) is a major engineering achievement that resulted in a patent.** Total detection/collection time is 12 sec.

The air puff is triggered from nozzles in portal walls to dislodge explosive particles attached to the person. Once dislodged, such particles become entrained in the main ceiling-to-floor flow. Explosives are separated from the main airstream by the patented **preconcentrator** (the key invention that makes the EDP's design unique) in the ductwork near the passenger's feet.

The entire process (including analysis) is computer controlled and automated—requiring operator action only to resolve alarms.

The EDP's patented doorless **portal design** screens airline passengers without direct physical contact or constraints, and collects and detects explosives in both vapor and particulates.

5) What impact will this new technology or product have on the marketplace? On related industries? On society?

While explosive-detection devices are not subject to standardized, rigorous testing by an agency or institution to evaluate system effectiveness and safety, the FAA funds development and tests promising products to determine if its specifications/requirements are met. Although detecting bulk explosives is a relatively mature technology that easily can be tested for effectiveness, accuracy, and reliability, those technologies are unsuitable for people. However, trace explosives are more difficult to detect, the technology is younger, and the requirements aren't clearly defined. The rapid development of the EDP's technology has outpaced the FAA's development of standards to test the system.

Although the FAA has identified the EDP as the only FAA-funded trace explosives-detection system currently meeting all airport requirements/specifications, certification is unavailable for this new technology. **Note: The EDP sets standards for trace explosives detection rather than meeting them.**

The EDP can reduce risks associated with explosives, narcotics, or other detectable chemicals in such applications as:

- International airports and border crossings,
- People and articles at locations where an explosive could cause great bodily harm and/or property damage (i.e., federal buildings, courthouses, mailrooms, public, and sporting events, and subways).
- Inmates and packages at prisons.
- Visitors to military installations.

6) How is the new product or technology linked to 2000? (For example, does 2000 mark the first sale, the beginning of development, the first beta site, or the first major application?)

The EDP significantly changes the threshold of explosives detection. Sandia National Laboratories licensed the EDP to Barringer Instruments, Inc. in June 1999.

Barringer will be introducing the EDP into the marketplace in late 2000. The commercial air-traffic industry is expected to deploy the EDP to detect trace explosives in all major airports as soon as possible to reduce substantially the risks of terrorist bombings.

The EDP is the first
- Commercially feasible,
- Technologically sound, and
- User-friendly trace-explosives system available to the air traffic industry.

Applications in other high-risk public facilities are likely to follow.

7) What significant technical challenges had to be overcome in the development of this new product or technology? What risks were taken or investments made to allow development of the new product or technology?

The key invention that makes the EDP design unique and practical is the **preconcentrator**, whose design had to meet FAA specifications and several requirements for the EDP application. Each of the two preconcentrators had to accommodate a 9,600 L/min airflow rate.

Also, the preconcentrator had to

- Separate explosive vapors and particles from the 9,600 L/min airflow and deliver them to the detector at less than 10 L/min.
- Allow quick heating (1–2 secs) from room temperature to 200°C to deliver explosives to the detector upon sample completion.
- Be efficient (up to 100% if possible) in collecting heavy-organic molecule (potential explosives) vapor, while allowing the large airflow balance to pass to the exhaust.

- Efficiently collect these small particles less than 15 microns in diameter.
- Handle the airflow and increased temperature of thousands of cycles without maintenance for the thousands of passengers daily.
- Be small (about 1 cubic foot) to fit in a reasonably sized portal system and be relatively inexpensive (less than $5,000).

8) Did any unique or interesting partnerships evolve that facilitated development of the new product or technology? How did they contribute?

The partnership was the licensing of the EDP to Barringer Instruments, Inc. Sandia National Laboratories is purely research and development DOE laboratory.

However, it took the combining of Sandia to development the technology and Barringer to commercialize the system.

9) What is the estimated market potential of the new product or technology? How was this determined?

To commercialize the EDP, Sandia selected Barringer (from more than 12 competing companies after an intense review of technical capability) to license this new technology. In June 1999, Barringer signed an exclusive licensing agreement with Sandia to manufacture and market the EDP.

For more than a decade, international and domestic airport security has hoped for a product to detect explosives and reduce the criminal/terrorist threats to air travel. **Our EDP is seen by many as the first screening device to meet the stringent requirements of the market-place of providing an effective, affordable, reliable, fast, and noninvasive screening method for airline passengers.**

Barringer expects to begin marketing the EDP in 2000. Barringer's partnership with Sandia will be mutually beneficial, but **the air-traveling public stands to gain the most from widespread use of the EDP.**

Barringer's marketing sources project EDP sales within the next 5 years to be $30 million. These projected sales figures are considered conservative and likely will be revised upwards as the news spreads about this innovative technology. *(This confidential information is released to Industry Week with an understanding that it's proprietary to both Barringer and Sandia & is provided here solely to demonstrate the EDP's commercial viability.)*

10) If the technology or new product is in use, please describe the benefits the user is enjoying. Also, please provide the name, address, and phone number of a user for follow-up.

Sandia licensed the EDP to Barringer Instruments, Inc. in June 1999. Barringer Technologies Inc. is the premier provider of advanced technology for security, law enforcement, and other applications. According to Barringer, the EDP will enter the marketplace in 2000. The commercial air-traffic industry is expected to deploy the EDP to detect trace explosives in all major airports as soon as possible to reduce substantially the risk of terrorist bombings.